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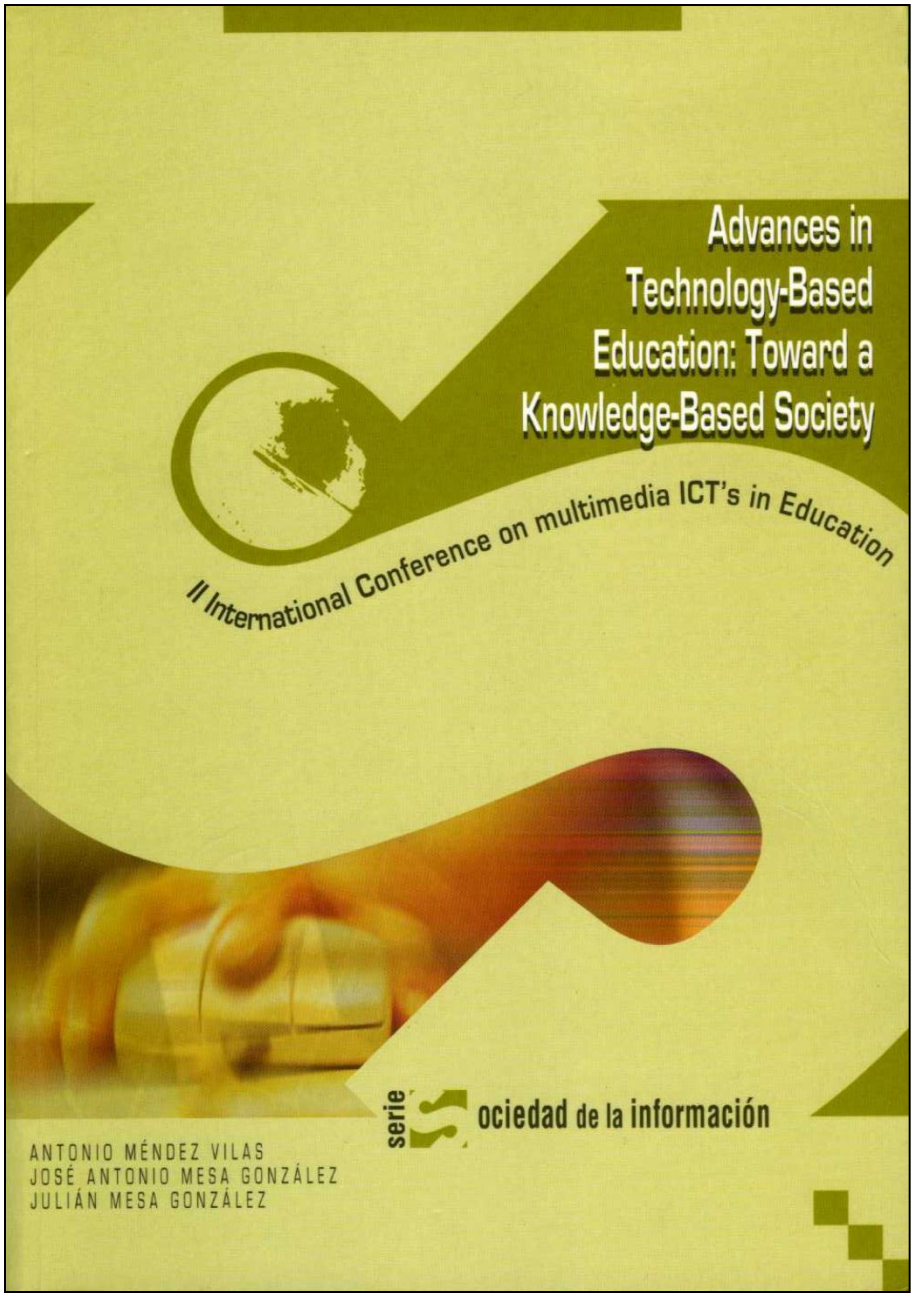

SCHOOL CHANGE THROUGH INTEGRATION OF ICTE'S – A CASE STUDY

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This paper is about an investigation that has been conducted with the main goal of evaluating educational changes operated by the integration of Information and Communication Technologies in Education (ICTE's). We describe a case study carried out in one of the pilot secondary schools under the aegis of the Centre of Competence of University of Minho (CCUM) of the "21st Century Nónio Programme", the ministerial institution responsible for promoting ICTE's integration in Portugal. We monitored the project devised for this school during the three years of its implementation and development (1997/2000), by using mainly qualitative research tools, such as *in loco* observation, research diaries, field notes, report analysis, and interviews of participants; for the quantitative approach an evaluation instrument of ICTE's integration was devised and validated, based upon a model provided by the National Council for Educational Technology of the United Kingdom. Finally, the results of that evaluation are presented, which point at the extremely important role that ICTE's play in the learning process and in learners' autonomy, namely by encouraging the setting up of "collaborative learning communities".

1. Introduction

Many authors agree that today's society is deeply marked by the importance and breadth of Information and Communication Technologies (ICT's) in the different knowledge domains. Indeed, this fact is responsible for a socio-cultural paradigm shift, commonly referred to as *Information Society* (Lyon, 1992; Lévy, 1994; Castells, 1999; Galbreath, 1999; Oliver, 1999; Silva, 2002).

The conjunction of this new reality – the transformation of atoms into *bits* and the creation of a digital world (Negroponte, 1995) – has resulted in an acceleration of events, which in turn is reflected in the speed of discoveries and inventions at every level that require a constant adaptation of both people and organizations in order to cope with society and its phenomena. That is why it is imperative for schools to keep up with technological innovation, because ICT's are, indirectly, a source of organizational change (Gonçalves, 2002).

Most school community agents have already realised that a lot of developments have occurred in society in the last few years and feel that the old school format no longer answers the challenges posed by the *Information Society*. Educational authors and authorities are conscious that young people have remarkable aptitude and motivation for using and exploring ICT's. According to Educational Scientists, a new educational paradigm has to be created (Bertrand & Valois, 1994), and so educational authorities have been promoting and encouraging school change, namely through the integration of ICTE's. This effort of implementing new technologies in schools is considered to be beneficial on several accounts. Firstly, ICTE's help to improve teaching/learning conditions, as well as to diversify knowledge sources and contribute to knowledge enrichment. Secondly, when ICTE's are used by student communities they become excellent collaborative learning tools, as they free learners of spacial and time restraints. Finally, ICTE's offer information in a non-sequential way that is similar to some brain functions and, used beyond the school environment, they enhance student autonomy and develop student capacities for learning throughout their lives (Knapp & Glenn, 1996; Dias, 2001; Machado, 2001; Moura, 1998; Lévy, 2000). So, we can conclude that ICTE's are almost universally acknowledged as real social/educational development factors.

In this context, and responding to the need of innovation and adaptation of Portuguese schools to modern challenges, we have witnessed a constant and progressive integration of ICTE's through the implementation of a great number of programmes and projects. One of them, the "21st Century Nónio Programme", created by the Education Ministry in 1997, has been responsible for the creation of many school projects, from pre-primary to secondary level. In order to investigate the ICTE integration in one of the "Nónio schools", during its entire duration (three school years), we embarked

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upon a research endeavour whose general paths and main results will be briefly described in the following sections[2].

2. Methodology

The pilot school, which we named Tresorres School (TS)[3], had applied for the *Nónio Programme* with its "X" Project, through CCUM[4]. The "X" Project lasted for three school years (from 1997 to 2000) and its the main goal was to promote the integration of extracurricular ICTE'S by equipping the school with ICTE'S tools and by giving ICTE'S instruction to teachers. The use of ICTE'S equipment was to be introduced in some clubs and extracurricular activities, namely: Multimedia Club (MC), Producing and Reproducing of Multimedia Data (PRMD), Journalism Club (JC) and Study Class (SC).

The goal of the investigation was the following: to see if integration of ICTE's contributes, and in what way, to **educational change** in three main domains: (i) the relationship of the educational community with knowledge; (ii) teaching practices, and (iii) the structural organization of the school.

This study falls within the theoretical underpinnings of three major paradigms, *viz*. the critical, construtivist and naturalistic paradigms (Guba, 1990). As to the methodology, we adopted a study case format (Yin, 1984; Cohen & Manion, 1994), by using mainly qualitative methods and techniques of research, together with some quantitative research tools. In more detail:

1. We adopted the following paradigms: *Critical*, because we used *in loco* observation to make a qualitative assessment of the pilot school reality; *Construtivist*, because (a) the investigation environment was specific and dependant, in form and content, on the participants; (b) the interaction between the investigator and her work was paramount; (c) the research was based on mental constructs and the interpretation of previously obtained data. Finally, it was *Naturalistic* because the *in loco* observation of the study case took place in the pilot school, which in turn opened up further avenues of investigation that can be explored in future studies.
2. According to Yin (1984) and Cohen & Manion (1994), a study case allows for a phenomenon to be studied in context, and so it is considered to be more open in the field and less likely to be manipulated by the researcher. The investigator can involve themselves actively in the field, observe the "actors", analyse and interpret the latter's atitudes, behaviour, and performance. In order to maintain as much objectivity as possible, the data collection process must be detailed and varied.
3. While collecting the data, we used the following qualitative research methods:

- *In loco* observation and informal discussions with the educational community, including field notes;
- Research diaries;
- Interviews of previously selected participants (teachers, students, the Head of the Parents' Association, Boarding School members, and the member of staff in charge of the Educational Resource Centre)
- Analysis of reports provided by the pilot school
- Analysis of reports on equipment utilisation.

We complemented the study using some quantitative data collection tools: we devised and validated a questionnaire on evaluation and integration of ICTs in the school based on a model provided by the British National Council for Educational Technology.

4. We followed both *a priori* validation process, *i.e*. before applying it to the pilot school population; and *a posteriori* one, when we triangulated the data collected yielded by the questionnaire. The analysis and interpretation of the data provided us with a myriad of insights about the school dynamics introduced by ICTE'S integration, of which a brief summary is presented below.

3. Main results and discussion

From the multiple facts and activities we had the opportunity to witness and monitor during the observation and data collection phase, we would like to mention and discuss the following:

[2] This investigation was part of a PhD project that the first author has recently concluded. This paper is a brief summary of that study. For those interested in the whole study, please see Gonçalves (2002).
[3] This is a pilot secondary school in the district of Oporto. It was thus called in order to preserve the anonymity of both the school and the participants.
[4] On assessment of CCUM work on pilot schools projects, see Silva & Silva (2002).

1. Tresorres School (TS) went through a very dynamic process of change at several levels: (a) a *technological* one, as its Educational Resources Centre and Library were being equipped with ICTE'S by the Nonio Programme, and whose use in extracurricular classes was meant to encourage and improve their use in the classroom; (b) a *structural* one, because TS had been involved in a new system of management that followed the School Autonomy Decree issued from the Education Ministry. In the first two years of the Nonio Programme (1997/99) in TS, the school was managed by an Executive Committee composed by a group of very innovative teachers. Some of them came from the Minerva Programme (another ICT Promoting Programme launched in the middle eighties in Portugal, that has inculcated an ICT culture in its participants), and constituted a Leadership Community in ICTE'S as described by Maurer & Davidson (1998); (c) and finally a *structural-pedagogical* one, as a curricular change was being carried out, whose consequences seemed to be viewed differently by the several educational community members. According to these new directives, for instance, ICTE's integration was to be promoted across the whole curriculum, and subjects were taught in 90-minute slots, and not the traditional 45.

The implementation of the School Autonomy Decree called for elections. These were hotly disputed between two groups of teachers – the Leadership Community in ICTE'S and another one that held more conservative views about ICTE'S integration. Unexpectedly, the second list won the election and took over as the new School Executive Board. So a social environment of dissension became noticeable, which proved to be harmful to both the effort of ICTE'S integration and the "X" Project.

According to Dahrendorf's (1954) and Weber's (1971) theories of social conflict, it can be argued that the teacher community in this school had started to split long ago, especially as far as ways of thinking about education and culture were concerned, which in turn were based on political and ideological differences.

2. The integration process of ICTE's increased considerably in the first two years, when even other educational projects used ICTE's equipment from the "X" Project. Some teachers of the Leadership Community in ICTE's used the Educational Resources Centre (ERC) and Library to teach their classes. Other teachers seemed to become more aware of the necessity of a shift in educational paradigm, but, on the whole, only 10 to 20% of teachers used ICTE's equipment of the ERC and the Library.

3. The use of ICTE's by teachers decreased during the third and last year, due to organizational changes enforced by the new School Executive Board, namely the imposition of time and space restrictions on the use of ICTE's upon teachers. So, those who had started using the ERC, the Library and their ICTE's equipment had to slow down; whereas those who had never used the facilities continued to ignore them. This situation aggravated the lack of communication between the two ideological/pedagogical tendencies and the lack of recognition of the initiatives in ICTE's led by the Leadership Community.

4. The Nonio Programme was not sufficiently publicised in TS. As far as the teachers were concerned, only those who attended the Scientific Board meetings knew about the "X" Project, but even those, not in detail. Besides, some of the teachers who claimed to endorse the view that extracurricular activities contribute to an educational paradigm shift did not encourage their students to enrol. All in all, most teachers revealed doubts about the extent to which ICTE's help promote learner personal education, and had very little information about how ICTE's use was organized across the curriculum.

5. Only three teachers received training in ICTE's under the CCUM Nonio Programme[5], although most teachers expressed their willingness to refresh their ICTE's knowledge, provided the courses were held at their own school. The co-ordinator of the "X" Project offered ICTE's assistance to his colleagues, but only a few asked for it. The main reasons for failing to take advantage of this offer of assistance were, among others, insecurity, resistance towards change and lack of time, especially due to very extensive syllabuses to teach. These results match those of several investigations (Hannafin & Saveneye, 1993; Hargreaves, 1998).

6. During the three years of Nonio Programme in TS, there was an increase in the use of ICTE's in the library, mainly of the Internet and electronic encyclopaedias, and especially of "chat-rooms" software. Actually, a lot of students used their personal computer to do their schoolwork, even when teachers did not ask for it. In conclusion, students were the educational elements who took more advantage of mediated access to ICTE's equipment and were very vocal about their wish to have more and better equipment. Unfortunately, this did not occur because there was a lack of personnel in the school and the teachers did not have time to pay attention to ICTE's use.

6. Analysing the existing ICTE's equipment in TS, there was a ratio of one computer per 245 students; as to the teaching staff, the ratio was one computer per 57 teachers. These figures fell short of the

[5] According to Silva & Silva (2002), CCUM provided its associated schools with a wide range of instructional activities from 1997 till 2001: 2 courses, 9 Meetings/Seminars, 38 workshops (covering domains like image in education, Internet services; web page construction; project assessment); 2 international conferences.

recommendations issued by the Education Ministry and the Educational Technology Investigators (DAPP, 2001; Silva, 2001)[6]. Unfortunately, the educational community does not seem to regard ICTE's equipment for generalised classroom use as a priority.

7. In the Journalism Club, the enrolment of new members was not carefully monitored, so there was a decrease of interest; Study Class also saw its activities strongly reduced, mainly because the teachers involved felt that their work was not getting enough recognition by the new Executive Board; Producing and Reproducing of Multimedia Data (PRM) finished because its teachers were not given the necessary conditions to continue the project. In general, only a few attempts were made to set up learning communities.

8. The technological change, implemented in the first two years, introduced a slight change in the relationships amongst the different members of educational community, but a lack of conditions seems to have prevented its consolidation. For example, teachers tended to follow pre-existing instructional practices, perhaps because they were given neither enough space nor time to accommodate change. On the other hand, both the changeover of the school management team and the climate of dissent it originated also seem to have hindered the integration process of ICTE's in the school. In fact, it can be said that the spirit of **complicity** that had existed between the Leadership Community in ICTE's and the former School Board was no longer there, and this is essential for a healthy ICTE's integration process (Ramos, 1999; Maurer & Davidson, 1998).

9. Nevertheless, the lack of conditions was not in itself an obstacle in the search for solutions. When the "X" Project finished, some teachers from the Leadership Community in ICTE's were successful in applying for the integration of Tresorres School in a new Education Ministry Programme on the development of a nation-wide Library Net, which will no doubt lead to further improvements in the integration process of ICTE's in the school environment.

4. Conclusion

ICTE's are very powerful media and when wisely used can provide invaluable educational resources, as they facilitate change and the sharing of life experiences, and give people the opportunity of self-improvement. In TS, we saw that ICTE's proved to be regarded as dynamic resources and facilitating tools in the teaching/learning process, as well as an "open window" into educational/technological evolution, just as the Information Society claims. We think that the former Executive Board not only openly endorsed the manifold advantages that the integration of ICTE's bring to the school community, but also acknowledged the need to create the necessary conditions for its implementation, namely that (i) ICTE's contribute to diversify pedagogical practices in order to promote school results; (ii) they are part of a coherent pedagogical structure; (iii) teachers/educators need to be able to work in an environment of experience, cooperation and constant perfection; (iv) ICTE's integration can be a "catalysing" element of change.

Furthermore, we would like to argue that ICTE's are a powerful agent of organizational change in schools, as they can (i) help establish new relationships between educational community elements and knowledge domains; (ii) improve pedagogical practices and therefore facilitate learning; (iii) when properly supported by organizational infra-structures and a Leadership Community, they help optimise teacher training education.

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[6] The Education Ministry has established a ratio of 1 computer per 10 students in its Resolution nº 16126/2000 of 2000/08/08.

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